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(54) Thermal transfer image receiving sheet and production process therefor

Bildempfangsmaterial für thermische Farbstoffübertragung und dessen Herstellungsverfahren

Matériau récepteur d'image pour le transfert thermique et son procédé de fabrication

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(56) References cited:
EP-A- 0 283 048
EP-A- 0 333 873
EP-A- 0 425 681
EP-A- 0 474 355

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Description

BACKGROUND OF THE INVENTION

The present invention relates to a thermal transfer image receiving sheet and a process for producing such a sheet, and more particularly to a thermal transfer image receiving sheet having a dye receptor layer which is capable of forming a good image by using a thermal transfer system.

Heretofore, various thermal transfer methods have been known. Among these, there has been proposed a method wherein a sublimable dye (or subliming dye) is used as a recording agent, and is carried on a substrate film such as paper and plastic film to obtain a thermal transfer film, and various full colour images are formed on an image receiving sheet such as paper and plastic film having thereon a dye receptor layer, by using the resultant thermal transfer film.

In such a case, a thermal head of a printer is used as hearing means so that a large number of colour dots of three or four colours are transferred to the image receiving sheet under heating in a very short period of time. As a result, a full colour image of an original is reproduced by using the multi-colour colour dots.

The thus formed images are very clear and are excellent in transparency, since the dyes are used therein as a colorant. Accordingly, these images are excellent in half tone reproducibility and gradation characteristic, and are substantially the same as the images formed by the conventional offset printing and gravure printing. Further, when the above image forming method is used, there can be formed images of high quality which are comparable to full colour photographic images.

As the thermal transfer image receiving sheet to be used in the above sublimation type thermal transfer system, there has been used one comprising a substrate sheet and a dye receptor layer disposed thereon. However, since the image receiving sheet is heated at the time of the transfer operation, it causes considerable curl. In addition, in a case where such an image receiving sheet is left standing at a higher or lower temperature before it is used for the thermal transfer operation, it also causes curl, and cannot be fed to a printer in some cases.

As a method for solving such a problem of curl production, there has been proposed a method wherein a back coating layer is bonded to a surface of a substrate sheet reverse to the surface thereof on which a dye receptor layer is formed (Japanese Laid Open Patent Application (JP A, KOKAI) No. 214484/1988), a method wherein an ionization radiation curing adhesive is disposed between a substrate sheet and a dye receptor layer (Japanese Laid Open Patent Application No. 24794/1989), etc.. In these methods, however, the problems of curl production has not sufficiently been solved yet.

In the above thermal transfer method, for the purpose of improving the migrating property of the dye, both of the dye layer and dye receptor layer are caused to have a smooth surface so that the thermal transfer sheet may closely contact the thermal transfer image receiving sheet, and a release agent such as silicone oil is contained in or release agent such as silicone oil is contained in or applied onto the dye layer and/or dye receptor layer so that these layers are not bonded to each other by heat fusion after the printing operation.

Accordingly, the resultant transferred image has excellent surface gloss; but is not suitable in a case where a matted image such as cloth or texture design is desired. Further, when the dye receptor layer is partially transferred to plain paper, etc., to form an image on the dye receptor layer, and ordinary letters, etc., are printed on another portion by another means, the resultant image formed on the dye receptor layer is utterly different from that formed on the plain paper portion. As a result, the entirety of the resultant images appear to be unsuitable or inadequate.

Further, other letters, etc., are written on the above image by using another means such as a pencil, in some cases. In such a case, however, it is difficult to effect writing because of the surface smoothness or the presence of the release agent.

As a method for solving the above problem there is known a method wherein a so called mat agent (or matting agent) such as kaolin clay, silica, and calcium carbonate is added to the dye receptor layer, as a disclosed in, e.g., Japanese Laid Open Patent Application No. 105689/1987. However, in such a method, a large amount of the mat agent is required in order to reduce the resultant gloss, and therefore the dye receiving property of the dye receptor layer is diminished. As a result, the reproducibility of dots is decreased to cause white dropout or roughening, whereby the resultant image quality is considerably lowered.

Japanese Laid Open Patent Application No. 55190/1990 discloses a method wherein a sheet for regulating (or modifying) the surface condition is pressed to the surface of the thermally transferred image under heating so as to mat the image. In this method, however, heating operation is required and there is posed a problem such that the formed dye image is blurred.

Further, in most cases, it is necessary to record information such as letters and symbols, simultaneously with the formation of the above dye image. As a matter of course, such letter information can simultaneously be recorded by using the sublimation type thermal transfer system. However, the resultant letter image formed by such a system is generally unclear because of a limit to the resolution of a thermal head to be used in the above system, and is inferior in image density to black letters provided by other printing means such as heat melting type thermal transfer systems, and

electrophotographic systems.

Accordingly, there has been used a method wherein a gradation image such as photographic image is formed by the sublimation type thermal transfer system and another letter image is formed by other means as described above. In such a case, however, the adhesion property of the other letter images to the receptor layer is poor, so that such images are liable to be peeled by rubbing, etc..

In the above thermal transfer method, for the purpose of improving the migrating property of the dye, both of the dye layer and dye receptor layer are caused to have a smooth surface so that the thermal transfer sheet may closely contact the thermal transfer image receiving sheet, and a release agent such as silicone oil is contained in or applied onto the dye layer and/or dye receptor layer so that these layers are not bonded to each other by heat fusion after the printing operation.

In such a case, however, there is a problem in that the adhesion property between the thermal transfer sheet and dye receptor layer is poor, and therefore the migration of the dye is obstructed, and white dropout, image defects, etc., are produced in the resultant image.

Such a problem may also be posed in the same manner, in a case where postcard paper, plain paper, etc., having rough texture are used as the substrate sheet of the image receiving sheet, in place of the mat image receiving sheet, and minute defects are present in the dye receptor layer on the basis of the above rough texture of the substrate.

EP-A-0283048 discloses a thermal transfer image receiving sheet comprising a substrate sheet and a dye receptor layer disposed on at least one surface side of the substrate sheet. In EP-A-0333873 such a thermal transfer image receiving sheet is made by a transfer process in which they dye receptor layer is formed first on a transfer film and is transferred to the substrate of the thermal transfer image receiving sheet by adhering the transfer film bearing the dye receptor layer via an adhesive layer to the substrate and peeling the transfer film away leaving the dye receptor layer transferred to the substrate. EP-A-0474355 contains a similar disclosure.

An object of the present invention is to provide a thermal transfer image receiving sheet having a dye receptor layer which is capable of forming a good image by using a thermal transfer system, and a process for producing such a sheet.

According to a first aspect of the invention, there is provided a thermal transfer image receiving sheet comprising a substrate sheet and a dye receptor layer disposed on at least one surface side of the substrate sheet, wherein the dye receptor layer has been formed on the substrate sheet by superposing the substrate sheet onto a receptor layer transfer film comprising a substrate film and the dye receptor layer disposed on one surface side thereof which is peelable from the substrate film, so that the receptor layer transfer film is bonded to the substrate sheet to form a laminate, and peeling the substrate film from the laminate, wherein the surface of the substrate sheet which is superposed on to the receptor transfer layer has a Bekk smoothness of 100 to 20,000 sec.

According to the above first embodiment, there may easily be provided a thermal transfer image receiving sheet of excellent surface smoothness.

The dye receptor layer may contain a fibrous inorganic filler. There can then be formed a matted image capable of being subjected to a writing operation, without decreasing the resultant image quality.

The substrate sheet may be formed by laminating at least two heat-shrinkable sheet materials so that the difference between the heat shrinkage directions thereof corresponds to an angle of 45 degrees or below. The occurrence of curl in the thermal transfer image receiving sheet can thus effectively be prevented at the time of thermal transfer operation.

The image receiving sheet may have a total tear strength (inclusive of initial tear strength) in the range of 20 to 200, as measured according to JIS-P-8116 and thus can easily be torn by hand or by various machines.

The image receiving sheet may have a total rigidity in the range of 10 to 100 m^3, as measured according to JIS-P-8143 so that it can easily be subjected to folding or filing.

The substrate sheet may comprise a heat-resistant synthetic paper which has been formed by stretching a composition comprising a synthetic resin and a filler, and crosslinking the synthetic resin component by use of an electron beam.

There may thus easily be provided a thermal transfer image receiving sheet which is excellent in heat resistance.

The dye receptor layer may comprise a resin and a release agent and the release agent may be contained in an amount of 0 to 10 wt. parts with respect to 100 wt. parts of the resin. Dye images excellent in gradation property and non-gradation images excellent in image density and resolution may be formed on the same recording sheet.

At least one layer constituting the thermal transfer image receiving sheet may be coloured pale blue.

The image quality of the resultant image can thus be maintained for a long period of time. Particularly in the case of a transparent type, the visibility of the resultant image is improved in addition to the maintenance of the image quality.

The dye receptor layer may contain substantially no filler and may have a surface glossiness of 30% or below.

Thus, there may be provided a thermal transfer image receiving sheet which is capable of providing matted images free of blurring and which can be subjected to writing operation.

The dye receptor layer or layers may be disposed on at least one surface side of the substrate sheet through the medium of a bubble containing layer, wherein the bubble containing layer contains a filler.

The dye receptor layer or layers may be disposed on at least one surface side of the substrate sheet through the

medium of a bubble containing layer and an intermediate layer.

There may thus easily be provided a thermal transfer image receiving sheet excellent in surface strength and having an improved cushion property.

According to a second aspect of the invention, there is provided a process for producing a thermal transfer image receiving sheet, comprising:-

superposing a substrate sheet on to a receptor layer transfer film comprising a substrate film and a dye receptor layer disposed on one surface side thereof which is peelable from the substrate film, so that the receptor layer transfer film is bonded to the substrate sheet to form a laminate, and

peeling the substrate film from the laminate thereby to form a dye receptor layer on at least one surface side of the substrate sheet, wherein the surface of the substrate sheet which is superposed on to the receptor transfer layer has a Bekk smoothness of 100 to 20,000 sec.

A thermal transfer image receiving sheet excellent in surface smoothness can thus be provided at a high productivity and a low cost, without subjecting the substrate sheet used therefor to a sealing operation.

These and other objects, features and advantages of the present invention will become more apparent upon a consideration of the following description of the preferred embodiments of the present invention taken in conjunction with the accompanying drawings, in which:-

Figure 1 is a schematic sectional view showing an embodiment of the thermal transfer image receiving sheet according to the present invention.

Figure 2 is a schematic sectional view showing another embodiment of the thermal transfer image receiving sheet according to the present invention

Figure 3 is a view for illustrating a shrinkage direction in a thermal transfer image receiving sheet.

Figure 4 is a schematic sectional view showing another embodiment of the thermal transfer image receiving sheet according to the present invention.

Figure 5 is a schematic sectional view showing another embodiment of the thermal transfer image receiving sheet according to the present invention.

Figure 6 is a schematic sectional view showing a transparent type thermal transfer image receiving sheet according to the present invention.

Hereinbelow, the present invention will be described in more detail with reference to preferred embodiments thereof.

Referring to Figure 1, a thermal transfer image receiving sheet according to the present invention comprises a substrate sheet 1, and a dye receptor layer 2 disposed on at least one surface side of the substrate sheet 1. In this embodiment, the dye receptor layer 2 is disposed on one surface side of the substrate sheet 1.

<u>Substrate sheet</u>

Specific examples of the substrate sheet to be used in the present invention may include various papers such as synthetic paper (polyolefin type, polystyrene type, etc.), paper of fine quality or wood free paper, art paper or coated paper, cast coated paper, wall paper, backing paper, synthetic resin impregnated paper or emulsion impregnated paper, synthetic rubber latex impregnated paper, synthetic resin containing paper, paper board, cellulose fiber paper, and the like; and various sheets or films of plastics such as polyolefin, polyvinyl chloride, polyethylene terephthalate, polystyrene, polymethacrylate, polycarbonate, and the like. Further, the substrate film 1 may also comprise a white opaque film formed from a mixture of the above synthetic resin and white pigment or filler, or a foamed sheet which has been subjected to foaming operation. However, the substrate sheet 1 usable in the present invention should not be restricted to the above specific examples.

In addition, a laminate comprising an optional combination of the above substrate films may also be used as the substrate sheet 1. Representative examples of such a laminate may include: a combination of cellulose fiber paper and synthetic paper, and of cellulose fiber paper and a plastic film or sheet.

The above substrate film may have an appropriate thickness, and for example, it may generally have a thickness of

about 10 to 300 μm.

In a case where the thermal transfer image receiving sheet is disposed (or scrapped) or cut into an appropriate size after the use thereof, etc., when the image receiving sheet is torn by hand or cut by means of a knife, scissors, a shredder and the like, the substrate sheet may preferably have a tear strength (or tear propagation strength) in the range of about 15 to 185 as measured according to JIS-P-8116, in consideration of a balance between the strength thereof and easiness in the tearing or cutting thereof. When such a substrate sheet is used, the entirety of the thermal transfer image receiving sheet may have a tear strength of 20 to 200, so that it may easily be torn by hands or cut by means of various machines.

In a case where the thermal transfer image receiving sheet is further subjected to folding or filing operation, the substrate sheet may preferably have a rigidity in the range of about 7 to 95 m^3 as measured according to JIS-P-8143, in consideration of the easiness in folding and prevention of bulkiness thereof after the filing. When such a substrate sheet is used, the entirety of the thermal transfer image receiving sheet may have a rigidity in the range of 10 to 100 m^3, so that it may easily be subjected to folding or filing operation.

The substrate sheet may also comprise a laminate for the purpose of preventing the occurrence of curl in the thermal transfer image receiving sheet. Figure 2 is a schematic sectional view showing an embodiment of the thermal transfer image receiving sheet according to the present invention wherein such a substrate film, of a laminate type is used.

Referring to Figure 2, the substrate sheet 1 comprises a laminate comprising a core material 11 of paper, etc., and heat shrinking (or heat shrinkable) sheet material layers 12 and 12' disposed on both surface sides of the core material 10, and a dye receptor layer 13 is formed on at least one surface side of such a laminate.

Figure 3 is a schematic view for illustrating the direction of the heat shrinkage of the two heat shrinking sheet 12 and 12' of the above thermal transfer image receiving sheet. The direction of the heat shrinkage is defined as a direction wherein the largest shrinkage of the heated material is observed.

In Figure 3, the direction of the heat shrinkage of the sheet disposed on the front side is denoted by an arrow of a solid line, and the direction of the heat shrinkage of the sheet disposed on the back side is denoted by an arrow of a broken line. In Figure 3A, the directions of the heat shrinkage of the films disposed on front and back sides are perpendicular to each other. In such a case, the resultant thermal transfer image receiving sheet causes considerable curl. In Figure 3B, the directions of the heat shrinkage of the films disposed on front and back sides form an angle of about 25° (25 degrees) therebetween. In such a case, the resultant thermal transfer image receiving sheet causes a little curl, which is in a practically tolerable range. In Figure 3C, the directions of the heat shrinkage of the films disposed on front and back sides are substantially the same as each other. In such a case, in the resultant thermal transfer image receiving sheet, the occurrence of curl is prevented most effectively.

The core material 11 to be used for such a purpose may be selected from various films and sheets for substrate film as described above. In consideration of the cost, nerve, etc., of the core material, preferred examples thereof may include various papers such as paper of fine quality or wood free paper, art paper or coated paper, cast coated paper, wall paper, backing paper, synthetic resin impregnated paper or emulsion impregnated paper, synthetic rubber latex impregnated paper, synthetic resin containing paper, and paper board. The above core material may have an appropriate thickness, but it may generally have a thickness of about 30 to 200μm.

As the heat shrinking sheet materials 12 and 12' to be laminated on both sides of the above core material 11, there may be used synthetic paper, synthetic resin sheet, foamed polypropylene, foamed polyethylene, foamed polystyrene, etc.. Among these, synthetic paper or foamed polypropylene is preferred in view of various strengths and cushion property.

The heat shrinking sheet material may preferably have a thickness of 30μm to 80μm. It is preferred that the heat shrinking sheet materials 12 and 12' comprising the same material and having the same thickness are laminated on both sides of the core material 11. However, it is possible that heat shrinking sheet materials comprising different materials and having different thicknesses are laminated on both sides of the core material, as long as the difference (or deviation) between the directions of the heat shrinkage thereof is in the range of 45 degrees or smaller, more preferably 30 degrees or smaller.

The resultant laminate (substrate sheet) having a three layer structure may preferably have a total thickness in the range of 100 to 300 μm, which may appropriately be determined in consideration of its nerve, curl, weight, cost, conveying property,, etc..

In the above embodiment, two heat shrinking sheet materials are bonded to both surfaces of the core material. However, a similar effect may be obtained when the core material is omitted and the two sheet materials are directly laminated on each other.

The substrate sheet to be used in the present invention may also comprise a heat resistant synthetic paper having a porosity. Such a heat resistant synthetic paper may be obtained by stretching a composition comprising a porous synthetic resin and a filler to form a porous synthetic paper, and subjecting the resultant porous synthetic paper to crosslinking treatment by means of an electron gun, etc..

The porous synthetic paper to be used in the present invention may be obtained by melt kneading a composition

comprising a thermoplastic resin such as polypropylene and an inorganic filler, forming the resultant kneaded product into a film by an extrusion film formation process, and then stretching the film in the longitudinal direction thereof to form a core material, extrusion laminating films comprising a similar composition as described above on both sides of the core material, and stretching the resultant laminate in the lateral direction thereof. The porous synthetic paper per se and the production process therefor per se may be those known in the prior art.

In the electron beam crosslinking treatment of the above porous synthetic paper, known synthetic paper as such may be irradiated with an electron beam. In such a case, however, the resultant degree of crosslinking (or crosslinking degree) is relatively low as compared with the electron beam irradiation dose. Accordingly, it is preferred to preliminarily incorporate an electron beam crosslinking component in the porous synthetic paper before the electron beam irradiation.

Specific examples of such a crosslinking component may include polymers, oligomers and/or monomers having a radical polymerizable double bond in the structure thereof. More specifically, such polymers may include: polyester resin, polyether resin, acrylic resin, epoxy resin, urethane resin, alkyd resin, spiro acetal resin, polybutadiene resin, polythiol polyene resin, etc.. The above oligomers may include: polyfunctional (meth)acrylates comprising polyhydric alcohols, etc.. The above monomers may include: monofunctional monomers such as ethyl (meth)acrylate, ethylhexyl (meth)acrylate, styrene, methylstyrene, and N vinylpyrrolidone; and polyfunctional monomers such as divinylbenzene, trimethylolpropane tri(meth)acrylate, hexanediol di(meth)acrylate, tripropyleneglycol di(meth)acrylate, diethyleneglycol di(meth)acrylate, pentaerythritol tri(meth)acrylate, dipentaerythritol hexa(meth)acrylate, 1,6-hexanediol di(meth)acrylate, and neopentyl glycol di(meth)acrylate.

Specific examples of a peroxide capable of providing a radical under the action of an electron beam may include organic peroxide such as acetyl cyclohexyl peroxide, isobutyl peroxide, diisopropyl peroxide carbonate, di-n-propyl peroxide carbonate, dimyristyl peroxide carbonate, di(2-ethoxyethyl)peroxide carbonate, 2,4-dichlorobenzoyl peroxide, t-butyl peroxypivalate, 3,5,5-trimethyl hexanonyl peroxide, octanonyl peroxide, lauroyl peroxide, acetyl peroxide, m-toluoyl peroxide, benzoyl peroxide, cyclohexanone peroxide, methyl ethyl ketone peroxide, dicumyl peroxide, and cumene hydroperoxide.

In general, the above crosslinking component is added to a resin composition before the film formation of the porous synthetic paper. It is generally preferred to prepare a synthetic paper which contains a non volatile crosslinking component in advance. However, it is also possible to use a method wherein commercially available porous synthetic paper is impregnated with an oligomer or monomer (particularly, a polyfunctional monomer) having a relatively low molecular weight, or with a solution prepared by dissolving the above peroxide in an organic solvent.

Since the crosslinking component to be contained in a resin may be changed corresponding to the kind, molecular weight, number of functional groups thereof, it is difficult to determine the addition amount therefor in a single way. However, in general, the addition amount of the crosslinking component may be in the range of 0.5 to 50 wt. parts with respect to 100 wt. parts of the thermoplastic resin such as polypropylene.

The electron beam to be used for the crosslinking of the synthetic paper containing the crosslinking component may be one having an energy of 50 to 1,000 KeV, more preferably 100 to 300 KeV, which may be emitted from various electron beam accelerator such as Cockroft Walton type, Van de Graf type, resonance transformer type, insulating core transformer type, linear type, Dynamitron type, and high frequency type.

The thus obtained heat resistant synthetic paper may have an appropriate thickness, and for example, it may generally have a thickness of about 10 to 300 μm.

When the above substrate film shows a poor adhesion with respect to the dye receptor layer to be formed thereon, it is preferred to subject the surface of the film to primer treatment or corona discharge treatment.

Dye receptor layer

The dye receptor layer to be formed on the surface of the above substrate film is such that it may receive a sublimable dye migrating from (or transferring from) the thermal transfer sheet and may retain the thus formed image.

For the purpose of forming the dye receptor layer, the receptor layer transfer film is superposed on the above substrate sheet for the thermal transfer image receiving sheet, and thereafter the substrate film of the receptor layer transfer film is peeled from the resultant superposition thereby to transfer the dye receptor layer to the above substrate.

The receptor layer transfer film to be used in the present invention comprises a substrate film and a dye receptor layer disposed on one side thereof, wherein the dye receptor layer is peelable from the substrate film. In a preferred embodiment, a heat sensitive or pressure sensitive adhesive layer is disposed on the surface of the receptor layer.

According to an embodiment of the present invention, the above receptor layer transfer film is superposed on a substrate sheet for an image receiving sheet, these sheets are pressed by appropriate pressing means thereby to bond these sheets to each other, and then the substrate film is peeled from the resultant superposition, thereby to obtain a desired thermal transfer image receiving sheet.

In another embodiment of the present invention, when the substrate of the image receiving sheet comprises a plas-

tic sheet, the surface of the receptor layer may be extrusion coated with the above plastic material, thereby to omit a step of forming a heat sensitive or pressure sensitive adhesive layer on the surface of the receptor layer constituting the receptor layer transfer film.

The substrate film to be used for the receptor layer transfer film according to the present invention may be the same as that used in the conventional thermal transfer film as such. However, the substrate film usable in the present invention is not restricted to such a conventional substrate film, but may also be another substrate film.

Specific examples of the preferred substrate film may include: thin papers such as glassine paper, capacitor paper, and paraffin paper; plastic sheets or films comprising plastics such as polyester, polypropylene, cellophane, polycarbonate, cellulose acetate, polyethylene, polyyinyl chloride, polystyrene, nylon, polyimide, polyvinylidene chloride, and ionomer; substrate films comprising a composite of such a plastic sheet or film and the paper as described above; etc..

The thickness of the substrate film may appropriately be changed corresponding to the material constituting it so as to provide suitable strength and heat resistance thereof, but the thickness may preferably be 3 to 100 μm.

It is preferred to form a release layer on the surface of the substrate film, prior to the formation of the receptor layer. Such a release layer may be formed from a release agent such as waxes, silicone wax, silicone resins, fluorine containing resins, and acrylic resins. The release layer may be formed in the same manner as that for a receptor layer as described hereinbelow. It is sufficient that the release layer has a thickness of about 0.5 to 5 μm. When a matte (or matted) receptor layer is desired after the transfer operation, it is possible to incorporate various particles in the release layer, or to use a substrate film having a matted surface on the release layer side thereof so as to provide a matted surface. As a matter of course, when the above substrate film has an appropriate releasability, it is not necessary to form the release layer.

The dye receptor layer to be formed on the surface of the above substrate film is one such that it may receive a sublimable dye migrating from (or transferring from) the thermal transfer film after it is transferred to a transfer receiving material, and may retain the thus formed image.

Specific examples of the resin for forming the dye receptor layer may include: polyolefin type resin such as polypropylene; halogenated polymer such as polyvinyl chloride, vinyl chloride-vinyl acetate copolymer, ethylene-vinyl acetate copolymer, and polyvinylidene chloride; vinyl type polymers such as polyvinyl acetate and polyacrylic acid esters; polyester type resin such as polyethylene terephthalate and polybutylene terephthalate; polystyrene type resins; polyamide type resins; copolymer resins comprising olefin such as ethylene and propylene, and another vinyl monomer; ionomers, cellulose type resins such as cellulose diacetate; polycarbonate; etc.. Particularly preferred examples thereof may include vinyl type resins and polyester type resins.

Preferred examples of the release agent to be used as a mixture with the above resin may include: silicone oil, phosphoric acid ester type surfactants, fluorine containing surfactants, etc.. Particularly preferred examples thereof may include silicone oil. Such a silicone oil may preferably be a modified silicone oil such as epoxy modified silicone oil, alkyl modified silicone oil, amino modified silicone oil, carboxyl modified silicone oil, alcohol modified silicone oil, fluorine modified silicone oil, alkylaralkylpolyether modified silicone oil, epoxy polyether modified silicone oil, and polyether modified silicone oil.

The release agent may be used either singly or as a combination of two or more species thereof. The release agent may preferably be added to the dye receptor layer in an amount of 0.5 to 30 wt. parts with respect of 100 wt. parts of the resin constituting the dye receptor layer. If such an addition amount is not in the above range, there occurs a problem such that the thermal transfer film sticks to the dye receptor layer or the printing sensitivity can be lowered, in some cases. When the above release agent is added to the dye receptor layer, the release agent is bled or exuded to the surface of the receptor layer after the transfer operation so as to form thereon a release layer.

The receptor layer may be formed by applying a solution or dispersion to one side surface of the above substrate film and then drying the resultant coating. The dispersion may be prepared by adding an additive such as release agent, to the resin as described above, as desired, and dissolving the resultant mixture in an appropriate organic solvent, or by dispersing the mixture in an organic solvent or water. The resultant solution or dispersion may be applied on to the substrate sheet, e.g., by a gravure printing method, a screen printing method, a reverse roll coating method using a gravure plate, etc..

When the above receptor layer is formed, a fluorescent brightening agent, a pigment or filler such as titanium oxide, zinc oxide, kaolin clay, calcium carbonate and silica fine powder can be added to the receptor layer for the purpose of improving the whiteness of the dye receptor layer to further improve the clarity (or colour definition) of the resultant transferred image.

The dye receptor layer to be formed in the above manner can have an arbitrary thickness, but may generally have a thickness of 1 to 50 μm. Such a dye receptor layer may preferably comprise a continuous coating but may also be formed as a discontinuous coating by using a resin emulsion or resin dispersion.

It is preferred to further dispose a heat-sensitive or pressure-sensitive adhesive layer on the surface of the above receptor layer so as to improve the transferability of the above layers. After the dye receptor layer is transferred to the substrate, the adhesive layer may also function as an intermediate layer with respect to the resultant image receiving

sheet. In the formation of the above adhesive layer, it is preferred to use adhesives for dry laminating such as two component type polyurethane type adhesive or epoxy type adhesive which have been used in the lamination of films in the prior art; adhesives for wet laminating such as vinyl acetate resin emulsion and acrylic resin emulsion; and hot melt adhesive such as ethylene-vinyl acetate copolymer type, polyamide type, polyester type, and polyolefin type. The adhesive layer may preferably have a thickness of about 0.5 to 40 μm.

When good cushion property or good heat insulating property at the time of image formation are required to be impaired to the thus obtained image receiving sheet, it is preferred to incorporate a foaming agent in the above adhesive.

The foaming agent to be used for such a purpose may be one which is capable of being decomposed under heating to generate a gas such as oxygen, carbonic acid gas, and nitrogen. Specific examples of such a foaming agent may include: decomposition type foaming agents such as dinitropentamethylenetetramine, diazoaminobenzene, azobisisobutyronitrile, and azodicarboamide; and known foaming agent (or foaming material) such as so-called micro balloon which may be prepared by microencapsulating a low-boiling point liquid such as butane and pentane, with a resin such as polyvinylidene chloride and polyacrylonitrile. Further, it is also possible to use a foaming material which is prepared by subjecting the above micro balloon to foaming operation in advance, or the above "micro balloon" coated with a white pigment.

The above foaming agent or foaming material may preferably be used in an amount such that the layer containing the bubbles may provide a foaming magnification (or expansion coefficient) in the range of about 1.5 to 20. For example, it is preferred to use the foaming agent or foaming material in an amount of 0.5 to 30 wt. parts with respect to 100 wt. parts of the resin constituting the adhesive layer functioning as an intermediate layer. The foaming agent may be subjected to a foaming operation at the time of the formation of the dye receptor layer transfer film, or at the time of the transfer of the dye receptor layer. In addition, it is possible that the receptor layer (and optionally, the intermediate layer) which is not subjected to the foaming operation is transferred to the substrate, and the receptor layer is subjected to the foaming operation under heating due to a thermal head at the time of image formation. The time of the foaming operation may arbitrarily be effected by selecting the kind of the foaming agent, the temperature used for transferring the dye receptor layer, etc..

In the above embodiment, the microcapsule type foaming agent such as "microsphere" has an outer wall even after the foaming operation, and therefore such a foaming agent is particularly preferred since it does not provide a defect such as a pin hole in the adhesive layer, tackiness agent layer, or receptor layer.

When a fluorescent brightening agent or a white pigment selected from various species thereof such as titanium oxide is added to the intermediate layer, in place of or in addition to the above foaming agent, the whiteness of the receptor layer after the transfer operation may be improved. In addition, when the substrate sheet for the thermal transfer image receiving sheet comprises paper, the yellowish hue of the paper may be hidden by the above agent or pigment. As a matter of course, another optional additive such as extender pigment and filler may be added to the intermediate layer, as desired.

Particularly, when the substrate for the thermal transfer image receiving sheet comprises a plastic sheet, the pressure sensitive adhesive layer may be omitted by adopting an extrusion laminating method as the film formation method therefor, and extruding the plastic sheet by extrusion coating on to the surface of the receptor layer constituting the dye receptor layer transfer film. It is also possible that the receptor layer surface of the receptor layer transfer film is subjected to laminating while a thermoplastic resin such as polyethylene is extruded to the above surface of the substrate for the thermal transfer image receiving sheet by using the above method, and then the substrate film of the receptor layer transfer film is peeled from the resultant laminate.

As the use of the thermal transfer method is widened, it has been desired that an image receiving paper which is similar to plain paper is used, and pulp paper such as plain paper is used as the substrate of the image receiving sheet. In such a case, it is possible to obtain an image receiving sheet (plain paper like image receiving sheet) which is similar to plain paper by regulating the Bekk smoothness of the paper to 100 to 20,000 sec.. Further, when the transfer surface of the receptor layer is caused to have a smoothness in the above range and the surface thereof reverse to the transfer surface is caused to have a smoothness of 5 to 400 sec. which is the same as that of plain paper, it is possible to obtain an image receiving sheet having a receptor layer excellent in smoothness while the entirety thereof is kept more plain paper like.

In the above method, static electricity is considerably generated when the substrate film is peeled after the receptor layer is transferred to the substrate for the image receiving sheet. As a result, a defect such as blister is caused in the transfer receptor layer to lower the resultant yield, the operability of the peeling, etc, is impaired, and further fire can be caused in some cases. Particularly, when a matted film is used as the substrate film or a matted release layer is disposed on the substrate film for the purpose of obtaining the plain paper like transfer receptor layer surface, the above problem of electrification becomes more serious.

In such a case, it is preferred to incorporate an antistatic agent in at least one layer selected from the substrate film, release layer, mat layer, dye receptor layer and adhesive layer constituting the receptor layer transfer film, and the sub-

strate for the image receiving sheet. Preferred examples of such an antistatic agent may include fatty acid esters, sulfuric acid esters, phosphoric acid esters, amides quaternary ammonium salts, betaines, amino acid salts, ethylene oxide adducts, etc.. The amount of the antistatic agent to be used for such a purpose can vary depending on the kind of the antistatic agent and the kind of the layer to which the antistatic agent is to be added. In all cases, the addition amount (or usage) thereof may preferably be 0.01 to 0.5 g/m^2 so as to provide a surface resistance of the receptor layer transfer film or the substrate for the image receiving sheet in the range of 10^8 to 10^{12} $\Omega \cdot$ cm. If the amount of the antistatic agent to be used for such a purpose is too small, the resultant antistatic effect is not sufficient. On the other hand, the addition amount thereof is too large, such a usage is not economical and a problem of stickiness (or tackiness) can occur.

In order to transfer the receptor layer, there may preferably be used an ordinary laminator. As the lamination means to be used for such a purpose may include, e.g., dry lamination, wet lamination, extrusion lamination, hot melt lamination, etc..

It is possible to add a fibrous inorganic filler (whisker) to the above dye receptor layer. Specific examples of the whisker may include: potassium titanate whisker, zinc oxide whisker, graphite whisker, silicon nitride whisker, silicon carbide whisker, etc.. Such a whisker may preferably be added to the dye receptor layer in an amount of 1.0 to 100 wt. parts with respect to 100 wt. parts of the resin constituting the dye receptor layer. The whisker may preferably have an average length of 5 to 50 μm, and may preferably have an average diameter of 0.1 to 1 μm. It is also possible to treat the surface of the whisker with an amino type or epoxy type silane coupling agent, titanate, etc., as desired, or to subject the surface to metallizing.

It is also possible to cause the dye receptor layer formed in the above manner to have a glossiness of 30% or lower, substantially without incorporating filler therein. For such a purpose, it is possible to use a method wherein the image receiving sheet is passed between a heated embossing roller and a nip roller, a method wherein the image receiving sheet is passed between heated nip rollers with a shaping sheet having surface unevenness configuration, etc..

In the above method using the embossing roller, when the surface unevenness of the embossing roller has a height of convexity (or depth of concavity) in the range of about 1 to 500 μm, and a pitch of the unevenness in the range of about 1 to 500 μm, the resultant shaped dye receptor layer may have a glossiness of 30% or lower.

In a case where the above shaping sheet is used, the shaping sheet may preferably have a surface unevenness having the above parameters in the same range as described above. When a texture similar to that of paper is imparted to the dye receptor layer, plain paper, etc., may be used as the shaping sheet.

In the present invention, the above glossiness may be measured by means of a gloss meter (trade name: KY5, mfd. by Asahi Seiko K.K.).

Basically, the thermal transfer image receiving sheet according to the present invention having the above structure will sufficiently be used for an intended purpose. In the present invention, however, a release agent can be contained in the dye receptor layer so as to impart thereto good releasability with respect to the thermal transfer sheet.

Preferred examples of the release agent to be used for such a purpose may include; silicone oil, phosphoric acid ester type surfactants, fluorine containing surfactants, etc.. Particularly preferred examples thereof may include silicone oil. Such a silicone oil may preferably be a modified silicone oil such as epoxy modified silicone oil, alkyl modified silicone oil, amino modified silicone oil, carboxyl modified silicone oil, alcohol modified silicone oil, fluorine modified silicone oil, alkylaralkylpolyether modified silicone oil, epoxy polyether modified silicone oil, and polyether modified silicone oil.

The release agent may be used either singly or as a combination of two or more species thereof. The release agent may preferably be added to the dye receptor layer in an amount of 0 to 20 wt. parts, particularly 3 to 12 wt. parts, with respect to 100 wt. parts of the resin constituting the dye receptor layer. If such an addition amount of the release agent is too small, there can occur a problem such that the thermal transfer sheet sticks to the dye receptor layer or the printing sensitivity can be lowered, while good adhesion property of the ink can be provided. On the other hand, the addition amount of the release agent is too large, good releasability with respect to the thermal transfer sheet may be obtained but the adhesion property of the ink is unsatisfactory.

The image receiving sheet according to the present invention is applicable to various uses such as transfer receiving sheet or card on which thermal transfer recording can be effected, and sheet for forming transmission type manuscript to be used for such a purpose.

In the image receiving sheet according to the present invention, it is also possible to dispose a primer layer or cushion layer, as desired, between the substrate film and the dye receptor layer. Particularly, when the cushion layer is disposed therebetween, noise produced at the time of printing can be suppressed and an image corresponding to image information can reproducibly be formed by transfer recording operation.

Figure 4 and Figure 5 are schematic sectional views showing embodiments of the thermal transfer image receiving sheet according to the present invention, respectively. Referring to Figure 4, the thermal transfer image receiving sheet comprises a substrate sheet 21, and a dye receptor layer 23 disposed on the substrate sheet 21 through the medium of a bubble containing layer (a cushion layer) 22. Referring to Figure 5, the thermal transfer image receiving sheet com-

prises a substrate sheet 31, and a dye receptor layer 34 disposed on the substrate sheet 31 through the medium of a bubble containing layer (a cushion layer) 32 and an intermediate layer 33.

In order to form the bubble containing layer 22 or 32, it is possible to use the same as that selected from various foaming agents and resins as described above. The bubble containing layer may preferably have a thickness of about 5 to 50 µm.

Specific examples of the material constituting the intermediate layer may include; polyurethane resin, acrylic resin, polyethylene type resin, epoxy resin, etc.. Among these, for example, a hard resin mixed with a curing agent is preferred for the purpose of improving the surface strength of the dye receptor layer. The intermediate layer may preferably have a thickness of about 0.1 to 25 µm.

Further, it is possible to add a filler to the above bubble layer 22 or intermediate layer 33 for the purpose of improving the surface strength of the dye receptor layer. As the filler, any of known fillers such as titanium oxide can be used.

It is also possible to dispose a lubricant layer (or lubricating layer) on the back side of the substrate film. Specific examples of the materials for constituting the lubricant layer may include methacrylate resins such as methyl methacrylate, acrylate resins corresponding to such a methacrylate resin, vinyl type resins such as vinyl chloride-vinyl acetate copolymer, etc..

In the thermal transfer image receiving sheet according to the present invention as described above, when at least one layer constituting the sheet, e.g., dye receptor layer, adhesive layer (primer layer), substrate sheet, back coating sheet, etc., is coloured pale blue, the quality of the formed image may be retained for a long period of time. Particularly, in the case of a transparent type thermal transfer image receiving sheet, the discernibleness of the formed image may be improved in addition to the above maintenance of the image quality.

Hereinbelow, there is described an embodiment wherein the above at least one layer is coloured pale blue, with reference to the transparent type thermal transfer image receiving sheet.

Referring to Figure 6, the transparent type thermal transfer image receiving sheet according to the present invention comprises a transparent substrate sheet 41, and a dye receptor layer 42 disposed on a surface of the substrate sheet 41. The image receiving sheet in this embodiment may further comprise an adhesive layer 43 and/or a back coating layer 44, as desired.

The transparent substrate sheet 41 may comprise a material selected from those for the substrate sheet as described above which is capable of providing transparency. Specific examples of such a transparent sheet may include films or sheets of various plastics such as acetylcellulose, polyolefin, polyvinyl chloride, polyethylene terephthalate, polystyrene, polymethacrylate and polycarbonate, which are the same as those used for a film which is to be used in a conventional OHP (overhead projector) or Schaukasten for the purpose of observing an image.

The dye receptor layer 42 may be formed in the same manner as described hereinabove.

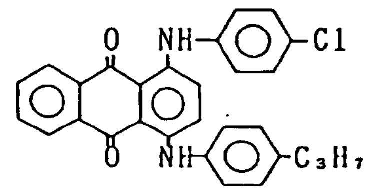
The colorant to be used for the above colouring may be one selected from various blue pigments and dyes. Among these, anthraquinon type dyes or phthalocyanine type dyes are preferred in view of the resultant transparency, heat resistance thereof, etc.. As a matter of course, it is possible to sue another dye or pigment such as cerulean blue and cobalt blue.

The colouring density may vary depending on the kind of the dye or pigment to be used therefor, but may preferably be such that it does not substantially lower the transparency of the image receiving sheet, and a light bluish hue is discernible when the resultant sheet is observed with naked eyes. The concentration of the colorant may preferably be about 0.01 to 0.5 wt.%.

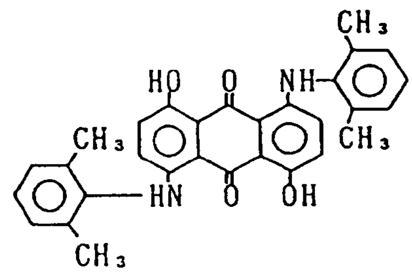
The hue of the blue colour is also important. When the discernibleness and durability of the image are comprehensively considered, it is preferred that the chromaticity is in the region surrounded by the three points of (x=0.310, y=0.316), (x=0.285, y=0.280) and (x=0.275, y=0.320) in CIE 1931 colorimetric system.

Specific examples of the dye suitably used for such colouring may include the following dyes:

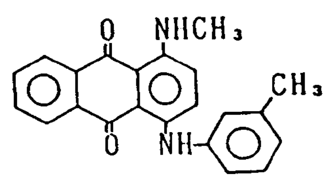
Dye (1)



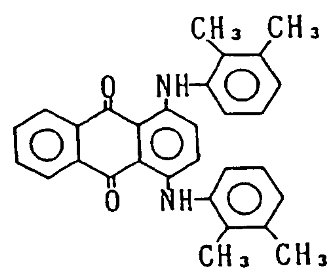
Dye (2)



Dye (3)



Dye (4)



When the image receiving sheet is coloured by using the above colorant, the method used for the colouring, per se may be a conventional method. For example, when the dye receptor layer, adhesive layer, or back coating layer is coloured, it is possible to dissolve or disperse an appropriate colorant in a coating liquid for forming such a layer. Further, when the substrate sheet is coloured, it is possible to use a so-called mass coloration (or mass colouring) method wherein an appropriate colorant is dissolved or dispersed in a resin for forming the substrate.

In the above embodiment, a transparent type image receiving sheet is described. However, the above description is also applicable to an opaque type thermal transfer image receiving sheet.

In the present invention, it is possible to dispose a detection mark in the image receiving sheet. The detection mark is very useful, e.g., in a case where the thermal transfer sheet is subjected to positioning operation with respect to the

image receiving sheet. For example, it is possible to dispose a detection mark which is detectable by means of a phototube detection device, on the back surface of the substrate film by printing, etc..

When thermal transfer operation is effected by using the above thermal transfer image receiving sheet according to the present invention, the thermal transfer sheet to be used in combination therewith is one comprising a sheet such as paper and polyester film, and a dye layer disposed thereon containing a sublimable dye. Any of the conventional thermal transfer sheet as such may be used in the present invention. In this case, when the whisker as described above is also added to the dye layer of the thermal transfer sheet, there can be provided a matted image having better quality.

Hereinbelow, there are described thermal transfer sheets for use with the image receiving sheets according to the present invention which are capable of forming good images in combination with any thermal transfer image receiving sheet inclusive of the thermal transfer image receiving sheet according to the present invention as described above.

The thermal transfer sheet may basically comprise a substrate film and a dye layer disposed thereon by the medium of an intermediate layer, as desired, in the same manner as in the prior art. The thermal transfer sheet may be characterized in that bubbles are incorporated in the dye layer and/or the intermediate layer.

The substrate film may preferably have a thickness of, e.g., about 0.5 to 50 μm, more preferably about 3 to 10 μm. Specific examples of the substrate film may include: various papers, various coated papers, polyester film, polystyrene film, polypropylene film, polysulfone film, aramide film, polycarbonate film, polyvinyl alcohol film, cellophane, etc.. Particularly preferred examples thereof may include polyester film. The substrate film may be either in a sheet form or a continuous film form, and should not be particularly restricted.

The dye layer to be formed on the above substrate film comprises, at least, an appropriate binder resin, and a dye and bubbles carried therein.

The dye to be used for such a purpose may be any of dyes usable in the conventional thermal transfer sheet, and is not particularly restricted. Preferred examples of such a dye may include: red dyes such as MS Red G, Macrolex Red Violet R, Ceres Red 7B, Samaron Red HBSL, Resolin Red F3BS; yellow dyes such as Horon Brilliant Yellow 6GL, PTY-52, Macrolex Yellow 6G; and blue dyes such as Kayaset Blue 714, Wacsorin Blue AP-FW, Horon Brilliant Blue S-R, and MS Blue 100.

As the binder for carrying the above mentioned dye, any of known binders can be used. Preferred examples of the binder resin may include: cellulose resins such as ethylcellulose, hydroxyethylcellulose, ethylhydroxycellulose, hydroxypropylcellulose, methylcellulose, cellulose acetate, and cellulose acetate butyrate; vinyl type resins such as polyvinyl alcohol, polyvinyl acetate, polyvinyl butyryl, polyvinyl acetal, polyvinyl pyrrolidone, and polyacrylamide; and polyester resin. Among these, cellulose type resins, acetal type resins, butyryl type resins, and polyester type resins are particularly preferred in view of heat resistance, migration property of the dye, etc..

The dye layer can further contain an additive selected from various additives known in the prior art, as desired.

Such a dye layer may preferably be formed by dissolving or dispersing the above mentioned sublimable dye, binder resin and another optional component in an appropriate solvent to prepare a coating material or ink for forming the dye layer; sequentially applying the coating material(s) or ink(s) on to the above mentioned substrate film; and drying the resultant coating.

The thus formed dye layer may generally have a thickness of about 0.2 to 5.0 μm, preferably about 0.4 to 2.0 μm. The sublimable dye content in the dye layer may preferably be 5 to 90 wt.%, more preferably 10 to 70 wt.% based on the weight of the dye layer.

In the formation of the dye layer, when a mono colour image is desired, a dye of one colour selected from the above dyes is used for such a purpose. When a full colour image is desired, for example, appropriate dyes of cyan, magenta and yellow colours (and further black colour, as desired) are selected to form dye layers of cyan, magenta and yellow colours (and further black colour, as desired).

It is also possible to dispose an intermediate layer between the substrate film and the dye layer, for the purpose of improving the adhesion property, cushion property, etc.. Specific examples of the material constituting the intermediate layer may include; polyurethane resin, acrylic resin, polyethylene type resin, butadiene rubber, epoxy resin, etc.. The intermediate layer may preferably have a thickness of about 0.1 to 5 μm, and may be formed in the same manner as in the case of the above dye layer.

Bubbles may be incorporated in at least one layer of the dye layer and the intermediate layer to be formed in the manner as described above. The method of incorporating the bubble in the above layer, may be one wherein a foaming agent is incorporated in a coating liquid to be used at the time of the formation of each of the respective layers, and the foaming agent is subjected to foaming operation at an appropriate temperature at the time of or after the drying of the coating formed by the application of the coating liquid.

The foaming agent to be used for such a purpose may be one which is capable of being decomposed at a high temperature to generate a gas such as oxygen, carbonic acid gas, and nitrogen. Specific examples of such a foaming agent may include: decomposition type foaming agents such as dinitropentamethylenetetramine, diazoaminobenzene, azobisisobutyronitrile, and azodicarboamide; and known foaming agent (or foaming material) such as so-called micro balloon which may be prepared by microencapsulating a low boiling point liquid such as butane and pentane, with a resin such

as polyvinylidene chloride and polyacrylonitrile. Further, it is also possible to use a foaming material which is prepared by subjecting the above micro balloon to foaming operation in advance.

The above foaming agent or foaming material may preferably be used in an amount such that the layer containing the bubbles may provide a foaming magnification (or expansion coefficient) in the range of about 1.5 to 20. Particularly preferred examples of the foaming agent may include the above micro balloon which can be subjected to the foaming operation at a relatively low temperature. Samples thereof of various grades are available from Matsumoto Yushi Seiyaku K.K., and each of them may be used in the present invention.

When the thermal transfer sheet according to the present invention is used, good dye migrating property may be obtained and high quality images having no defect such as white dropout or image incompleteness may be formed, even in combination with a matted image receiving sheet prepared by matting the dye receptor layer thereof.

When thermal transfer operation is effected by using the thermal transfer image receiving sheet according to the present invention in combination with the above described thermal transfer sheet, or a conventional thermal transfer sheet, the means for applying heat energy to be used for such a thermal transfer operation may be any of various known heat energy application means. For example, when a recording time is controlled by using a recording apparatus such as a thermal printer (e.g., Video Printer VY 100, mfd. by Hitachi K.K.), so as to provide a heat energy of about 5 to 100 mJ/mm^2, a desired image may be formed.

Hereinbelow, the present invention will be described in more detail with reference to Examples. In the description appearing hereinafter, part(s) and % are part(s) by weight and wt.%, respectively, unless otherwise noted specifically.

(Example A)

Example A-1

A coating liquid for a receptor layer having the following composition was applied on to a surface of a 15 μm thick polyester film (trade name: Lumirror, mfd. by Toray K.K.) by means of a bar coater so as to provide a coating amount of 5.0 g/m^2 (after drying), and the resultant coating was preliminarily dried by means of a dryer, and then dried in an oven for 30 min. at 100°C, whereby a dye receptor layer was formed.

Thereafter, a solution of an adhesive agent having the following composition was applied on to the above receptor layer so as to provide a coating amount of 1 g/m^2 (after drying) and then dried in the same manner as described above, thereby to form an adhesive layer whereby a receptor layer transfer film to be used in the present invention was obtained.

Composition of coating liquid for receptor layer

Vinyl chloride/vinyl acetate copolymer (#1000D, mfd. by Denki Kagaku Kogyo K.K.)	100 parts
Amino modified silicone (X-22-343, mfd. by Shinetsu Kagaku Kogyo K.K.)	3 parts
Epoxy modified silicone (KF-393, mfd. by Shinetsu Kagaku Kogyo K.K.)	3 parts
Methyl ethyl ketone/toluene (wt. ratio = 1/1)	500 parts

Composition of coating liquid for adhesive layer

Urethane type dry laminating agent (A-130, mfd. by Takeda Yakuhin Kogyo K.K.)	100 parts
Curing agent (A-3, mfd. by Takeda Yakuhin Kogyo K.K.)	30 parts

The receptor layer transfer film prepared above was superposed on a surface of a thermal transfer paper (Fax TRW, Bekk smoothness: 147 sec., mfd. by Canon K.K.), and the resultant superposition was passed through a laminator to bond these sheets to each other. Then, the substrate film of the receptor layer transfer sheet is peeled from the resultant laminate, thereby to obtain a thermal transfer image receiving sheet according to the present invention.

Example A-2

A thermal transfer image receiving sheet according to the present invention was prepared in the same manner as in Example A-1, except that a thermal transfer paper (TRW-C2, Bekk smoothness: 800 sec., mfd. by Jujo Seishi K.K.)

was used as the substrate sheet instead of the paper used in Example A-1.

Example A-3

A thermal transfer image receiving sheet according to the present invention was prepared in the same manner as in Example A-1, except that a thermal transfer paper (Bekk smoothness: 500 sec., mfd. by Jujo Seishi K.K.) was used as the substrate sheet instead of the paper used in Example A-1.

Example A-4

A thermal transfer image receiving sheet according to the present invention was prepared in the same manner as in Example A-1, except that a one side coated paper (Bekk smoothness: 1,500 sec. (receptor layer surface), and 50 sec. (back surface) mfd. by Jujo Seishi K.K.) was used as the substrate sheet instead of the paper used in Example A-1.

Claims

1. A thermal transfer image receiving sheet comprising a substrate sheet and a dye receptor layer disposed on at least one surface side of the substrate sheet,
   wherein the dye receptor layer has been formed on the substrate sheet by superposing the substrate sheet on to a receptor layer transfer film comprising a substrate film and the dye receptor layer disposed on one surface side thereof which is peelable from the substrate film, so that the receptor layer transfer film is bonded to the substrate sheet to form a laminate, and peeling the substrate film from the laminate, characterised in that the surface of the substrate sheet which is superposed on to the receptor transfer layer has a Bekk smoothness of 100 to 20,000 sec.

2. A thermal transfer image receiving sheet according to Claim 1, wherein the dye receptor layer is disposed on the substrate sheet through the medium of an adhesive layer.

3. A thermal transfer image receiving sheet according to Claim 2, wherein the adhesive layer contains at least one additive selected from the group consisting of a foaming agent, a white pigment, a fluorescent brightening agent, an extender pigment and a filler.

4. A thermal transfer image receiving sheet according to Claim 3, wherein the foaming agent is a microcapsule type.

5. A thermal transfer image receiving sheet according to Claim 1, wherein the dye receptor layer has been formed on the substrate sheet by superposing the substrate sheet on to the receptor layer transfer film by dry lamination, so that the receptor layer transfer film is bonded to the substrate sheet to form a laminate, and peeling the substrate film from the laminate.

6. A thermal transfer image receiving sheet according to Claim 1, wherein the dye receptor layer has been formed on the substrate sheet by superposing the substrate sheet on to the receptor layer transfer film by wet lamination, so that the receptor layer transfer film is bonded to the substrate sheet to form a laminate, and peeling the substrate film from the laminate.

7. A thermal transfer image receiving sheet according to Claim 1, wherein the dye receptor layer has been formed on the substrate sheet by extruding a material for the substrate sheet in a sheet form on to the receptor layer of the receptor layer transfer film by extrusion lamination, so that the receptor layer transfer film is bonded to the substrate sheet to form a laminate, and peeling the substrate film from the laminate.

8. A thermal transfer image receiving sheet according to Claim 1, wherein the dye receptor layer has been formed on the substrate sheet by superposing the substrate sheet on to the receptor layer transfer film by hot melt lamination, so that the receptor layer transfer film is bonded to the substrate sheet to form a laminate, and peeling the substrate film from the laminate.

9. A thermal transfer image receiving sheet according to any one of th preceding claims, wherein the surface of the substrate sheet on which the dye receptor layer is to be disposed is smoother than the opposite surface thereof.

10. A thermal transfer image receiving sheet according to any one of the preceding claims, wherein at least one of the

substrate sheet and the receptor layer transfer film contains an antistatic agent.

11. A thermal transfer image receiving sheet according to Claim 10, wherein at least one of the substrate film and the dye receptor layer of the receptor layer transfer film contains an antistatic agent.

12. A thermal transfer image receiving sheet according to Claim 10 or Claim 11, wherein the receptor layer transfer film further comprises a release layer between the substrate film and the dye receptor layer, and the release layer contains an antistatic agent.

13. A thermal transfer image receiving sheet as claimed in any preceding claim, wherein the dye receptor layer contains a fibrous inorganic filler.

14. A thermal transfer image receiving sheet according to Claim 13, wherein the dye receptor layer contains the fibrous inorganic filler in an amount of 1.0 to 100 wt.parts, preferably 30 to 60 wt.parts, with respect to 100 wt.parts of a resin constituting the dye receptor layer.

15. A thermal transfer image receiving sheet according to Claim 13 or Claim 14, wherein the fibrous inorganic filler has an average fibre length of 5 to 50 μm, and an average fibre diameter of 0.1 to 1 μm.

16. A thermal transfer image receiving sheet as claimed in any preceding claim, wherein the substrate sheet has been formed by laminating at least two heat-shrinkable sheet materials so that the difference between the heat shrinkag directions thereof corresponds to an angle of 45° or below.

17. A thermal transfer image receiving sheet according to Claim 16, wherein heat shrinkage directions of the two heat shrinkable sheet materials are substantially parallel to each other.

18. A thermal transfer image receiving sheet according to Claim 16, wherein the substrate sheet comprises a laminate having a three layer structure which comprises a core material and the heat-shrinkable sheet materials laminated on both sides of the core material.

19. A thermal transfer image receiving sheet according to Claim 18, wherein the heat-shrinkable sheet material has a thickness of 30 to 80 μm, and the substrate sheet has a thickness of 100 to 300 μm.

20. A thermal transfer image receiving sheet as claimed in any one of Claims 1 to 15, wherein the image receiving sheet has a total tear strength (inclusive of initial tear strength) in the range of 20 to 200, as measured according to JIS P 8116.

21. A thermal transfer image receiving sheet according to Claim 20, wherein the substrate sheet comprises paper.

22. A thermal transfer image receiving sheet as claimed in any one of Claims 1 to 15, the image receiving sheet having a total rigidity in the range of 10 to 100 m^3, as measured according to JIS-P-8143.

23. A thermal transfer image receiving sheet as claimed in any one of Claims 1 to 15, wherein the substrate sheet comprises a heat-resistant synthetic paper which has been formed by stretching a composition comprising a synthetic resin and a filler, and crosslinking the synthetic resin component by use of an electron beam.

24. A thermal transfer image receiving sheet according to Claim 23, wherein the synthetic resin component comprises at least one species selected from the group consisting of a monomer, a oligomer and a polymer having a radical polymerizable double bond.

25. A thermal transfer image receiving sheet as claimed in any one of Claims 1 to 15, wherein the dye receptor layer comprises a resin and a release agent and the release agent is contained in an amount of 0 to 10 wt.parts with respect to 100 wt.parts of the resin.

26. A thermal transfer image receiving sheet according to Claim 25, wherein the dye receptor layer contains at least one species selected from the group consisting of a fluorescent brightening agent, an antioxidant and an ultraviolet light absorber.

27. A thermal transfer image receiving sheet as claimed in any preceding claim, wherein at least one layer constituting the thermal transfer image receiving sheet is coloured pale blue.

28. A thermal transfer image receiving sheet according to Claim 27, wherein the sheet is transparent as a whole.

29. A thermal transfer image receiving sheet according to Claim 27, which has a chromaticity value in a region surrounded by three points of (x=0.310, y=0.316), (x=0.285, y=0.280) and (x=0.275, y=0.320) in the CIE 1931 colorimetric system.

30. A thermal transfer image receiving sheet as claimed in any one of Claims 1 to 12, or Claims 16 to 29 when not directly or indirectly dependent on any of Claims 13 to 15,
wherein the dye receptor layer contains substantially no filler and has a surface glossiness of 30% or below.

31. A thermal transfer image receiving sheet according to Claim 30, which has been formed by pressing a medium having unevenness on to the surface of the dye receptor layer so as to provide a surface glossiness of 30% or below.

32. A thermal transfer image receiving sheet as claimed in any preceding claim, wherein the dye receptor layer is disposed on at least one surface side of the substrate sheet through the medium of a bubble containing layer, wherein the bubble containing layer contains a filler.

33. A thermal transfer image receiving sheet as claimed in any preceding claim, wherein the dye receptor layer is disposed on at least one surface side of the substrate sheet through the medium of a bubble containing layer and an intermediate layer.

34. A thermal transfer image receiving sheet according to Claim 33, wherein at least one of the bubble containing layer and the intermediate layer contains a filler.

35. A process for producing a thermal transfer image receiving sheet, comprising:

superposing a substrate sheet on to a receptor layer transfer film comprising a substrate film and a dye receptor layer disposed on one surface side thereof which is peelable from the substrate film, so that the receptor layer transfer film is bonded to the substrate sheet to form a laminate, and
peeling the substrate film from the laminate thereby to form a dye receptor layer on at least one surface side of the substrate sheet, characterised in that the surface of the substrate sheet which is superposed on to the receptor transfer layer has a Bekk smoothness of 100 to 20,000 sec.

36. A process for producing a thermal transfer image receiving sheet according to Claim 35, wherein an adhesive layer is disposed on the surface of the dye receptor layer of the receptor layer transfer film.

37. A process for producing a thermal transfer image receiving sheet according to Claim 35, wherein the adhesive layer contains at least one additive selected from the group consisting of a foaming agent, a white pigment, a fluorescent brightening agent, an extender pigment and a filler.

38. A process for producing a thermal transfer image receiving sheet according to Claim 37, wherein the foaming agent is a microcapsule type.

39. A process for producing a thermal transfer image receiving sheet according to Claim 35, wherein the dye receptor layer transfer film is bonded to the substrate sheet by dry lamination.

40. A process for producing a thermal transfer image receiving sheet according to Claim 35, wherein the dye receptor layer transfer film is bonded to the substrate sheet by wet lamination.

41. A process for producing a thermal transfer image receiving sheet according to Claim 35, wherein the dye receptor layer transfer film is bonded to the substrate sheet by extrusion lamination.

42. A process for producing a thermal transfer image receiving sheet according to Claim 35, wherein the dye receptor layer transfer film is bonded to the substrate sheet by hot melt lamination.

43. A process for producing a thermal transfer image receiving sheet according to Claim 35, wherein the surface of the substrate sheet on which the dye receptor layer is to be disposed is smoother than the opposite surface thereof.

44. A process for producing thermal transfer image receiving sheet according to Claim 35, wherein at least one of the substrate sheet and the receptor layer transfer film contains an antistatic agent.

45. A process for producing a thermal transfer image receiving sheet according to Claim 44, wherein at least one of the substrate film and the dye receptor layer of the receptor layer transfer film contains an antistatic agent.

46. A process for producing a thermal transfer image receiving sheet according to Claim 44, wherein the receptor layer transfer film further comprises a release layer between the substrate film and the dye receptor layer, and the release layer contains an antistatic agent.

47. A process for producing a thermal transfer image receiving sheet according to Claim 35, wherein a medium having unevenness is pressed on to the surface of the dye receptor layer of the thermal transfer image receiving sheet, so as to provide a surface glossiness of the dye receptor layer of 30% or below.

Patentansprüche

1. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial mit einem Substratflachmaterial und einer Farbstoff-Aufnahmeschicht, die auf mindestens einer Oberflächenseite des Substratflachmaterials angeordnet ist, wobei die Farbstoff-Aufnahmeschicht auf dem Substratflachmaterial durch Auflegen des Substratflachmaterials auf einen Aufnahmeschicht-Transferfilm mit einem Substratfilm und der Farbstoff-Aufnahmeschicht, die auf einer Oberflächenseite des Substratfilms angeordnet ist und von diesem abgelöst werden kann, so daß der Aufnahmeschicht-Transferfilm mit dem Substratflachmaterial verbunden ist, um ein Laminat zu bilden, und Ablösen des Substratfilms von dem Laminat gebildet wurde, dadurch gekennzeichnet, daß die Oberfläche der Substratschicht, die auf die Aufnahme-Transferschicht gelegt ist, eine Bekk Glattheit von 100 bis 20.000 sec hat.

2. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 1, wobei die Farbstoff-Aufnahmeschicht auf dem Substratflachmaterial mittels einer Klebeschicht angeordnet ist.

3. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 2, wobei die Klebeschicht mindestens ein Zusatzmittel enthält, das ausgewählt ist aus der Gruppe bestehend aus einem Schäumungsmittel, einem weißen Pigment, einem fluoreszierenden Aufheller, einem Extender-Pigment und einem Füllmaterial.

4. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 3, wobei das Schäumungsmittel vom Mikrokapsel-Typ ist.

5. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 1, wobei die Farbstoff-Aufnahmeschicht auf dem Substratflachmaterial durch Legen des Substratflachmaterials auf den Aufnahmeschicht-Transferfilm durch Trockenlaminierung, so daß der Aufnahmeschicht-Transferfilm mit dem Substratflachmaterial verbunden ist, um ein Laminat zu bilden, und Ablösen des Substratfilms von dem Laminat gebildet wurde.

6. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 1, wobei die Farbstoff-Aufnahmeschicht auf dem Substratflachmaterial durch Legen des Substratflachmaterials auf den Aufnahmeschicht-Transferfilm durch Naßlaminieren, so daß der Aufnahmeschicht-Transferfilm mit dem Substratflachmaterial verbunden ist, um ein Laminat zu bilden, und Ablösen des Substratfilms von dem Laminat gebildet wurde.

7. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 1, wobei die Farbstoff-Aufnahmeschicht auf dem Substratflachmaterial durch Extrudieren eines Materials für das Substratflachmaterial in einer Blattform auf die Aufnahmeschicht des Aufnahmeschicht-Transferfilms durch Extrusions-Laminierung, so daß der Aufnahmeschicht-Transferfilm mit dem Substratflachmaterial verbunden ist, um ein Laminat zu bilden, und Ablösen des Substratfilms von dem Laminat gebildet wurde.

8. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 1, wobei die Farbstoff-Aufnahmeschicht auf dem Substratflachmaterial durch Legen des Substratflachmaterial auf den Aufnahmeschicht-Transferfilm durch Heißschmelz-Laminieren, so daß der Aufnahmeschicht-Transferfilm mit dem Substratflachmaterial verbunden ist, um ein Laminat zu bilden, und Ablösen des Substratfilms von dem Laminat gebildet wurde.

9. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der vorhergehenden Ansprüche, wobei die Fläche des Substratflachmaterials, auf welcher die Farbstoff-Aufnahmeschicht aufgebracht werden soll, glatter ist als seine entgegengesetzte Fläche.

10. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der vorhergehenden Ansprüche, wobei die Substratschicht und/oder der Aufnahmeschicht-Transferfilm ein antistatisches Mittel enthält.

11. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 10, wobei der Substratfilm und/oder die Farbstoff-Aufnahmeschicht des Aufnahmeschicht-Transferfilms ein antistatisches Mittel enthält.

12. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 10 oder 11, wobei der Aufnahmeschicht-Transferfilm weiterhin eine Freigabeschicht zwischen dem Substratfilm und der Farbstoff-Aufnahmeschicht aufweist und die Freigabeschicht ein antistatisches Mittel enthält.

13. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der vorhergehenden Ansprüche, wobei die Farbstoff-Aufnahmeschicht ein faseriges anorganisches Füllmaterial enthält.

14. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 13, wobei die Farbstoff-Aufnahmeschicht das faserige anorganische Füllmaterial in einer Menge von 1,0 bis 100 Gewichtsteile, vorzugsweise 30 bis 60 Gewichtsteile in bezug auf 100 Gewichtsteile eines Harzes, welches die Farbstoff-Aufnahmeschicht bildet, enthält.

15. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 13 oder 14, wobei das faserige anorganische Füllmaterial eine durchschnittliche Faserlänge von 5 bis 50μm und einen durchschnittlichen Faserdurchmesser von 0,1 bis 1μm hat.

16. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der vorhergehenden Ansprüche, wobei das Substratflachmaterial durch Laminieren von mindestens zwei wärmeschrumpfbaren Flachmaterialien gebildet wurde, so daß die Differenz zwischen ihren Wärmeschrumpfrichtungen einem Winkel von 45° oder weniger entspricht.

17. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 16, wobei die Wärmeschrumpfrichtungen der zwei wärmeschrumpfbaren Flachmaterialien im wesentlichen parallel zueinander sind.

18. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 16, wobei das Substratflachmaterial ein Laminat mit einer dreischichtigen Struktur aufweist, welche ein Kernmaterial und die auf beiden Seiten des Kernmaterials laminierten wärmeschrumpfbaren Flachmaterialien aufweist.

19. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 18, wobei das wärmeschrumpfbare Flachmaterial eine Dicke von 30 bis 80μm und das Substratflachmaterial eine Dicke von 100 bis 300μm hat.

20. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der Ansprüche 1 bis 15, wobei das eine Abbildung aufnehmende Flachmaterial eine gesamte Reißfestigkeit (einschließlich der anfänglichen Reißfestigkeit) im Bereich von 20 bis 200, gemessen nach JIS P 8116 hat.

21. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 20, wobei das Substratflachmaterial Papier aufweist.

22. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der Ansprüche 1 bis 15, wobei das eine Abbildung aufnehmende Flachmaterial eine gesamte Steifheit im Bereich von 10 bis 100m^3, gemessen nach JIS-P-8143 hat.

23. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der Ansprüche 1 bis 15, wobei das Substratflachmaterial ein wärmeresistentes synthetisches Papier aufweist, welches durch Strecken einer ein Kunstharz und ein Füllmaterial aufweisenden Zusammensetzung und Vernetzen der Kunstharz-Komponente durch Verwendung eines Elektronenstrahls gebildet wurde.

24. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 23, wobei die Kunstharz-Kompo-

nente mindestens eine Sorte, ausgewählt aus der Gruppe bestehend aus einem Monomer, einem Oligomer und einem Polymer mit einer polymerisierbaren Radikal-Doppelbindung aufweist.

25. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der Ansprüche 1 bis 15, wobei die Farbstoff-Aufnahmeschicht ein Harz und ein Freigabemittel aufweist und das Freigabemittel in einer Menge von 0 bis 10 Gewichtsteilen in bezug auf 100 Gewichtsteile des Harzes enthalten ist.

26. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 25, wobei die Farbstoff-Aufnahmeschicht mindestens eine Sorte, ausgewählt aus der Gruppe bestehend aus einem fluoreszierenden Aufheller, einem Oxidationsinhibitor und einem UV-Licht-Absorbierer enthält.

27. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der vorhergehenden Ansprüche, wobei mindestens eine Schicht, die das eine Abbildung aufnehmende Thermotransfer-Flachmaterial bildet, hellblau gefärbt ist.

28. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 27, wobei das Material im ganzen transparent ist.

29. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 27, welches einen Farbtonwert in einem Bereich eingeschlossen durch drei Punkte von (x=0,310, y=0,316), (x=0,285, y=0,280) und (x=0,275, y=0,320) in dem CIE 1931 Farbsystem hat.

30. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der Ansprüche 1 bis 12, oder 16 bis 29, falls nicht direkt oder indirekt abhängig von einem der Ansprüche 13 bis 15,
wobei die Farbstoff-Aufnahmeschicht im wesentlichen kein Füllmaterial aufweist und einen Oberflächenglanz von 30% oder weniger hat.

31. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 30, welches durch Pressen eines unebenen Mediums auf die Oberfläche der Farbstoff-Aufnahmeschicht gebildet wurde, so daß ein Oberflächenglanz von 30% oder weniger bereitgestellt wird.

32. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der vorhergehenden Ansprüche, wobei die Farbstoff-Aufnahmeschicht auf mindestens einer Oberflächenseite des Substratflachmaterials mittels einer Bläschen enthaltenden Schicht aufgebracht ist, wobei die Bläschen enthaltende Schicht ein Füllmaterial enthält.

33. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach einem der vorhergehenden Ansprüche, wobei die Farbstoff-Aufnahmeschicht auf mindestens einer Oberflächenseite des Substratflachmaterials mittels einer Bläschen enthaltenden Schicht und einer Zwischenschicht aufgebracht ist.

34. Ein eine Abbildung aufnehmendes Thermotransfer-Flachmaterial nach Anspruch 33, wobei die Bläschen enthaltende Schicht und/oder die Zwischenschicht ein Füllmaterial aufweist.

35. Ein Verfahren zum Erzeugen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials, welches aufweist: Legen eines Substratflachmaterials auf einen Aufnahmeschicht-Transferfilm, der einen Substratfilm und eine Farbstoff-Aufnahmeschicht aufweist, die auf einer Oberflächenseite davon angeordnet ist und von dem Substratfilm abgelöst werden kann, so daß der Aufnahmeschicht-Transferfilm mit dem Substratflachmaterial verbunden ist, um ein Laminat zu bilden, und
Ablösen des Substratfilms von dem Laminat, um hierdurch eine Farbstoff-Aufnahmeschicht auf mindestens einer Oberflächenseite des Substratflachmaterials zu bilden, dadurch gekennzeichnet, daß die Oberfläche des Substratflachmaterials, welches auf die Aufnahme-Transferschicht gelegt ist, eine Bekk-Glattheit von 100 bis 20.000 sec hat.

36. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 35, wobei eine Klebeschicht auf der Oberfläche der Farbstoff-Aufnahmeschicht des Aufnahmeschicht-Transferfilms aufgebracht ist.

37. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 35,

wobei die Klebeschicht mindestens ein Zusatzmittel enthält, welches ausgewählt ist aus der Gruppe bestehend aus einem Schäumungsmittel, einem weißen Pigment, einem fluoreszierenden Aufheller, einem Extenderpigment und einem Füllmaterial.

38. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 37, wobei das Schäumungsmittel vom Mikrokapsel-Typ ist.

39. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 35, wobei der Farbstoff-Aufnahmeschicht-Transferfilm mit der Substratschicht durch Trockenlaminieren verbunden wird.

40. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 35, wobei der Farbstoff-Aufnahmeschicht-Transferfilm mit dem Substratflachmaterial durch Naßlaminieren verbunden wird.

41. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 35, wobei der Farbstoff-Aufnahmeschicht-Transferfilm mit dem Substratflachmaterial durch Extrusionslaminieren verbunden wird.

42. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 35, wobei der Farbstoff-Aufnahmeschicht-Transferfilm mit dem Substratflachmaterial durch Heißschmelz-Laminieren verbunden wird.

43. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 35, wobei die Fläche des Substratflachmaterials, auf welche die Farbstoff-Aufnahmeschicht aufgebracht werden soll, glatter ist als seine entgegengesetzte Fläche.

44. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 35, wobei das Substratflachmaterial und/oder der Aufnahmeschicht-Transferfilm ein antistatisches Mittel enthält.

45. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 44, wobei der Substratfilm und/oder die Farbstoff-Aufnahmeschicht des Aufnahmeschicht-Transferfilms ein antistatisches Mittel enthält.

46. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 44, wobei der Aufnahmeschicht-Transferfilm weiterhin eine Freigabeschicht zwischen dem Substratfilm und der Farbstoff-Aufnahmeschicht aufweist, und die Freigabeschicht ein antistatisches Mittel aufweist.

47. Verfahren zum Herstellen eines eine Abbildung aufnehmenden Thermotransfer-Flachmaterials nach Anspruch 35, wobei ein unebenes Medium auf die Oberfläche der Farbstoff-Aufnahmeschicht des eine Abbildung aufnehmenden Thermotransfer-Flachmaterials gepreßt wird, so daß ein Oberflächenglanz der Farbstoff-Aufnahmeschicht von 30% oder weniger bereitgestellt wird.

Revendications

1. Feuille réceptrice d'image par transfert thermique comprenant une feuille de substrat et une couche d'un récepteur de colorant disposée sur au moins une face de la feuille de substrat,

dans laquelle la couche du récepteur de colorant a été formée sur la feuille de substrat, en superposant la feuille de substrat sur un film de transfert de la couche du récepteur, comprenant un film de substrat et la couche du récepteur de colorant disposée sur une de ses faces, que l'on peut peler du film de substrat, de telle sorte que le film de transfert de la couche du récepteur est fixé à la feuille de substrat pour former un stratifié, et en pelant le film de substrat du stratifié, caractérisé en ce que la surface de la feuille de substrat qui est superposée sur la couche de transfert du récepteur présente un lissé Bekk compris entre 100 et 20 000 sec.

2. Feuille réceptrice d'image par transfert thermique selon la revendication 1, dans laquelle la couche du récepteur de colorant est disposée sur la feuille de substrat par l'intermédiaire d'une couche adhésive.

3. Feuille réceptrice d'image par transfert thermique selon la revendication 2, dans laquelle la couche adhésive con-

tient au moins un additif sélectionné parmi le groupe composé d'un agent moussant, d'un pigment blanc, d'un agent azurant optique, d'un pigment d'allongement et d'une matière de charge.

4. Feuille réceptrice d'image par transfert thermique selon la revendication 3, dans laquelle l'agent moussant est du type à microcapsules.

5. Feuille réceptrice d'image par transfert thermique selon la revendication 1, dans laquelle la couche du récepteur de colorant a été formée sur la feuille de substrat en superposant la feuille de substrat sur le film de transfert de la couche du récepteur par stratification à sec, de telle sorte que le film de transfert de la couche du récepteur est fixé à la feuille de substrat pour former un stratifié, et en pelant le film de substrat du stratifié.

6. Feuille réceptrice d'image par transfert thermique selon la revendication 1, dans laquelle la couche du récepteur de colorant a été formée sur la feuille de substrat en superposant la feuille de substrat sur le film de transfert de la couche du récepteur par stratification à l'état humide, de telle sorte que le film de transfert de la couche du récepteur est fixé à la feuille de substrat pour former un stratifié, et en pelant le film de substrat du stratifié.

7. Feuille réceptrice d'image par transfert thermique selon la revendication 1, dans laquelle la couche du récepteur de colorant a été formée sur la feuille de substrat en superposant la feuille de substrat sur le film de transfert de la couche du récepteur par stratification par extrusion, de telle sorte que le film de transfert de la couche du récepteur est fixé à la feuille de substrat pour former un stratifié, et en pelant le film de substrat du stratifié.

8. Feuille réceptrice d'image par transfert thermique selon la revendication 1, dans laquelle la couche du récepteur de colorant a été formée sur la feuille de substrat en superposant la feuille de substrat sur le film de transfert de la couche du récepteur par stratification par fusion à chaud, de telle sorte que le film de transfert de la couche du récepteur est fixé à la feuille de substrat pour former un stratifié, et en pelant le film de substrat du stratifié.

9. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 8, dans laquelle la face de la feuille de substrat sur laquelle il convient de poser la couche du récepteur de colorant est plus lisse que la face opposée de celle-ci.

10. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 9, dans laquelle l'un au moins de la feuille de substrat et du film de transfert de la couche du récepteur contient un agent antistatique.

11. Feuille réceptrice d'image par transfert thermique selon la revendication 10, dans laquelle l'un au moins du film de substrat et de la couche du récepteur de colorant du film de transfert de la couche du récepteur contient un agent antistatique.

12. Feuille réceptrice d'image par transfert thermique selon la revendication 10 ou 11, dans laquelle le film de transfert de la couche du récepteur comprend en outre une couche de séparation entre le film de substrat et la couche du récepteur de colorant, la couche de séparation contenant un agent antistatique.

13. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 12, dans laquelle la couche du récepteur de colorant contient une matière de charge inorganique fibreuse.

14. Feuille réceptrice d'image par transfert thermique selon la revendication 13, dans laquelle la couche du récepteur de colorant contient la matière de charge inorganique fibreuse selon une proportion comprise entre 0,1 et 100 parties en poids, de préférence 30 - 60 parties en poids, sur la base des 100 parties en poids d'une résine constituant la couche du récepteur de colorant.

15. Feuille réceptrice d'image par transfert thermique selon la revendication 13 ou 14, dans laquelle la matière de charge inorganique fibreuse présente une longueur de fibre moyenne comprise entre 5 et 50 μm et un diamètre de fibre moyen compris entre 0,1 et 1 μm.

16. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 15, dans laquelle la feuille de substrat a été formée par stratification d'au moins deux feuilles en matière thermorétrécissable, de telle sorte que la différence entre les directions de thermorétrécissement de celles-ci corresponde à un angle inférieur ou égal à 45 °.

17. Feuille réceptrice d'image par transfert thermique selon la revendication 16, dans laquelle les directions de thermo-rétrécissement des deux feuilles en matière thermorétrécissable sont substantiellement parallèles l'une par rapport à l'autre.

18. Feuille réceptrice d'image par transfert thermique selon la revendication 16, dans laquelle la feuille de substrat comprend un stratifié présentant une structure en trois couches, comportant une matière de noyau et les feuilles en matière thermorétrécissable stratifiées sur les deux côtés de la matière de noyau.

19. Feuille réceptrice d'image par transfert thermique selon la revendication 18, dans laquelle la feuille en matière thermorétrécissable présente une épaisseur comprise entre 30 et 80 μm, la feuille de substrat présentant une épaisseur comprise entre 100 et 300 μm.

20. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 15, dans laquelle la feuille réceptrice d'image présente une résistance totale à la déchirure (y compris la résistance à la déchirure de départ) comprise dans la gamme allant de 20 à 200, telle que mesurée selon JIS P 8116.

21. Feuille réceptrice d'image par transfert thermique selon la revendication 20, dans laquelle la feuille de substrat comprend du papier.

22. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 15, la feuille réceptrice d'image présentant une rigidité totale comprise dans la gamme allant de 10 à 100 m^3, telle que mesurée selon JIS P 8143.

23. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 15, dans laquelle la feuille de substrat comprend un papier synthétique thermorésistant, qui a été formé par étirage d'une composition comprenant une résine synthétique et une matière de charge, et par réticulation du composant de résine synthétique à l'aide d'un faisceau d'électrons.

24. Feuille réceptrice d'image par transfert thermique selon la revendication 23, dans laquelle le composant de résine synthétique comprend au moins une espèce sélectionnée parmi le groupe composé d'un monomère, d'un oligomère et d'un polymère présentant une double liaison polymérisable par voie radicalaire.

25. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 15, dans laquelle la couche du récepteur de colorant comprend une résine et un agent de séparation, l'agent de séparation étant présent dans une proportion comprise entre 0 et 10 parties en poids, sur la base des 100 parties en poids de la résine.

26. Feuille réceptrice d'image par transfert thermique selon la revendication 25, dans laquelle la couche du récepteur de colorant contient au moins une espèce sélectionnée parmi le groupe composé d'un agent azurant optique, d'un antioxydant et d'un agent d'absorption des rayons ultraviolets.

27. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 26, dans laquelle au moins une couche composant la feuille réceptrice d'image par transfert thermique est colorée en bleu pâle.

28. Feuille réceptrice d'image par transfert thermique selon la revendication 27, dans lequel la feuille est transparente dans sa totalité.

29. Feuille réceptrice d'image par transfert thermique selon la revendication 27, présentant une valeur de chromaticité dans une zone délimitée par les trois points (x = 0,310, y = 0,316), (x = 0,285, y = 0,280) et (x = 0,275, y = 0,320) selon le système colorimétrique CIE 1931.

30. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 12, ou des revendications 16 à 29 lorsqu'elle n'est pas directement ou indirectement dépendante de l'une quelconque des revendications 13 à 15,

dans laquelle la couche du récepteur de colorant ne contient substantiellement pas de matière de charge et présente un brillant de surface de 30 % ou moins.

31. Feuille réceptrice d'image par transfert thermique selon la revendication 30, qui a été formé en pressant un milieu irrégulier sur la surface de la couche du récepteur de colorant de façon à fournir un brillant de surface de 30 % ou

moins.

32. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 31, dans laquelle la couche du réc pteur de colorant est disposée sur au moins une face de la feuille de substrat par l'intermédiaire d'une couche contenant des bulles, la couche contenant des bulles contenant une matière de charge.

33. Feuille réceptrice d'image par transfert thermique selon l'une quelconque des revendications 1 à 32, dans laquelle la couche du récepteur de colorant est disposée sur au moins une face de la feuille de substrat par l'intermédiaire d'une couche contenant des bulles et d'une couche intermédiaire.

34. Feuille réceptrice d'image par transfert thermique selon la revendication 33, dans laquelle l'une au moins de la couche contenant des bulles et de la couche intermédiaire contient une matière de charge.

35. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique, comprenant :

    la superposition d'une feuille de substrat sur un film de transfert de couche d'un récepteur comprenant un film de substrat et une couche d'un récepteur de colorant disposée sur une face de celui-ci, que l'on peut peler du film de substrat, de telle sorte que le film de transfert de la couche du récepteur est fixé à la feuille de substrat pour former un stratifié, et

    le pelage du film de substrat du stratifié, pour former ce faisant une couche du récepteur de colorant sur au moins une face de la feuille de substrat, caractérisé en ce que la face de la feuille de substrat qui est superposée sur la couche de transfert du récepteur présente un lissé Bekk compris entre 100 et 20 000 sec.

36. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 35, dans lequel une couche adhésive est disposée en surface de la couche du récepteur de colorant du film de transfert de la couche du récepteur.

37. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 35, dans lequel la couche adhésive contient au moins un additif sélectionné parmi le groupe composé d'un agent moussant, d'un pigment blanc, d'un agent azurant optique, d'un pigment d'allongement et d'une matière de charge.

38. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 37, dans lequel l'agent moussant est du type à microcapsules.

39. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 35, dans lequel le film de transfert de la couche du récepteur de colorant est fixé à la feuille de substrat par stratification à sec.

40. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 35, dans lequel le film de transfert de la couche du récepteur de colorant est fixé à la feuille de substrat par stratification à l'état humide.

41. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 35, dans lequel le film de transfert de la couche du récepteur de colorant est fixé à la feuille de substrat par stratification par extrusion.

42. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 35, dans lequel le film de transfert de la couche du récepteur de colorant est fixé à la feuille de substrat par stratification par fusion à chaud.

43. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 35, dans lequel la face de la feuille de substrat sur laquelle il convient de poser la couche du récepteur de colorant est plus lisse que la face opposée de celle-ci.

44. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 35, dans lequel l'un au moins de la feuille de substrat et du film de transfert de la couche du récepteur contient un agent antistatique.

45. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 44, dans lequel l'un au moins du film de substrat et de la couche du récepteur de colorant du film de transfert de la couche du récepteur contient un agent antistatique.

46. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 44, dans lequel le film de transfert de la couche du récepteur comprend en outre une couche de séparation entre le film de substrat et la couche du récepteur de colorant, la couche de séparation contenant un agent antistatique.

47. Procédé de fabrication d'une feuille réceptrice d'image par transfert thermique selon la revendication 35, dans lequel un milieu irrégulier est pressé sur la surface de la couche du récepteur de colorant de la feuille réceptrice d'image par transfert thermique, de façon à fournir un brillant de surface de la couche du récepteur de colorant de 30 % ou moins.

FIG.1

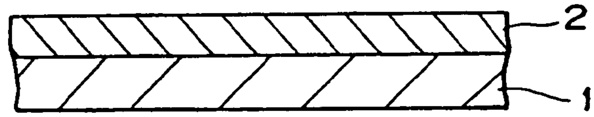


FIG.2

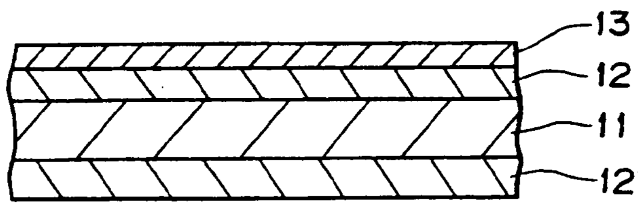


FIG.3(a) FIG.3(b) FIG.3(c)

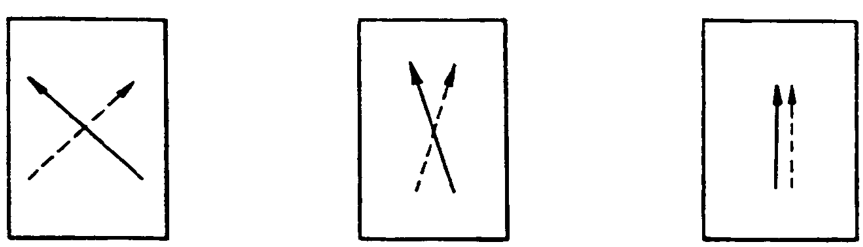


FIG.4

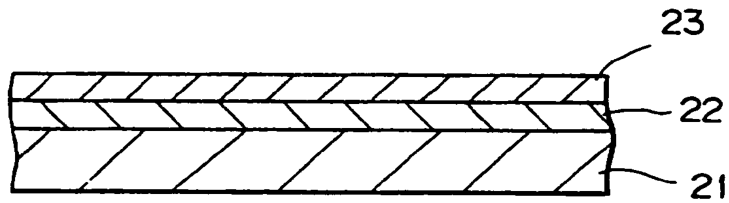


FIG.5

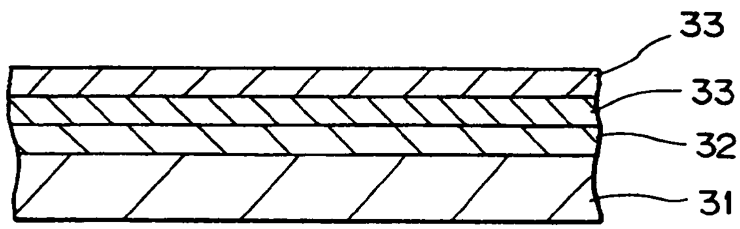


FIG.6